

THIN PLATE STORAGE CONTAINER

CROSS-REFERENCE TO RELATED APPLICATION

This application claims, under 35 USC 119,  
5 priority of Japanese Application No.2002-349457 filed  
December 2, 2002 and Japanese Application No.2003-35062  
filed February 13, 2003.

BACKGROUND OF THE INVENTION

10 ~~This~~ <sup>The</sup> present invention relates to ~~the~~ <sup>a</sup> thin plate  
storage container, in which the load ~~is~~ <sup>on the</sup> container body  
in transportation is reduced to improve sealing  
quality. ~~In addition, this~~ <sup>The</sup> present invention ~~further~~  
relates to a thin plate storage container ~~to~~ <sup>for securely</sup> supporting  
15 a plurality of thin plates stored within ~~a~~ <sup>the</sup> container  
body ~~securely~~.

~~For example, the~~ <sup>For</sup> transportable container ~~to~~ <sup>for</sup>  
containing ~~and transporting~~ <sup>ing</sup> semiconductor silicon wafers ~~inside and~~  
~~transport them~~ <sup>are</sup> is generally known. In such ~~a~~ <sup>a</sup> wafer  
20 container, it is important to keep its inside clean ~~for~~ <sup>to</sup>  
preventing dirt and the like ~~on the surface of~~ <sup>from collecting</sup> contained  
semiconductor silicon wafer ~~in~~ <sup>during</sup> transportation. For this  
purpose, the container is sealed tightly, ~~in such case~~  
usually ~~a~~ <sup>by</sup> a sealing member ~~is placed on~~ <sup>the</sup> lid of the  
25 container ~~and the~~ <sup>which</sup> sealing member contacts with the  
container body to seal it when the lid closes the  
container body.

In addition, the thin plate storage container ~~has~~ <sup>have</sup>

a handle on each side ~~of the container~~ to be gripped ~~for carrying~~ <sup>by hand</sup>.

Semiconductor silicon wafers are <sup>stored</sup> ~~contained~~ in the containers <sup>in</sup> ~~having~~ the above-mentioned <sup>for</sup> ~~structure~~ to transfer ~~them~~ to a semiconductor manufacturing factory and the like, <sup>where</sup> ~~Then~~ the container goes through a production line.

Moreover, it is necessary that the wafer container supports ~~the~~ semiconductor silicon wafers at regularly <sup>spaced</sup> intervals to keep them from contacting each other. Therefore supporting members are placed on both <sup>the interior</sup> ~~inside~~ of the container body and on <sup>the</sup> ~~interior~~ side of the lid to support semiconductor silicon wafers at regularly <sup>spaced</sup> intervals.

15 An example of supporting member <sup>a</sup> ~~of the~~ lid is illustrated in Fig. 26. This supporting member <sup>is</sup> ~~was~~ disclosed in ~~the~~ Japanese Patent Gazette ~~of~~ TOKUHYOHEI No. 4-505263. <sup>As shown</sup>

<sup>No 4</sup> Reference No. 35 in Fig. 26 is an upper cover. <sup>35 has a</sup> ~~Wafer~~ holder 36 <sup>is for</sup> ~~to~~ support semiconductor silicon wafers from <sup>above</sup> ~~its~~ <sup>mounted</sup> ~~upper part was positioned as a supporting member on the~~ inner side (lower side) ~~of the upper cover 35~~. The semiconductor silicon wafers 37 <sup>are</sup> ~~stored~~ in the container body (not illustrated) position below the upper cover 35.

The wafer holder 36 has supporting arm portions 38 alternately extending from right and left. Base end <sup>are</sup> ~~of~~ the supporting arms 38 <sup>is</sup> ~~is~~ fixed <sup>to</sup> ~~on~~ the interior side

of upper cover 35, and the <sup>opposite</sup> ~~other~~ end extends toward the semiconductor silicon wafer 37. <sup>A</sup> ~~And~~ a holddown member 39 at the tip of each of the supporting arm portions <sup>engages</sup> ~~engages~~ 38 <sup>an</sup> ~~engaged~~ with a edge portion of <sup>a</sup> ~~the~~ semiconductor silicon wafers 37 to support <sup>the</sup> ~~each~~ semiconductor silicon wafer 37 at regular <sup>spaced</sup> ~~intervals~~.

~~Then the thin plate storage container of above-mentioned structure is~~ <sup>In order to manually</sup> ~~lifted and lowered manually~~ <sup>for</sup> ~~to transport and the like. In this case,~~ a worker grips the handles to hold the thin plate storage container.

<sup>No. 11</sup> However, since the handles are <sup>located</sup> ~~placed~~ on each of the sidewalls of the thin plate storage container, ~~the~~ <sup>receive a</sup> ~~sidewalls are~~ loaded when the thin plate storage container is lifted. <sup>whereby the</sup> ~~Thereby an~~ opening of the container body can be slightly distorted and the sealing member can be <sup>This effect is undesirable</sup> ~~slightly slipped. In this case,~~ although there is no problem <sup>with</sup> ~~about~~ the sealing, ~~it is not good for the aim for perfection.~~

<sup>There</sup> ~~Besides it,~~ there is a slight gap between the container body and the lid when the container body is fitted with the lid. <sup>Although there</sup> ~~There is~~ no problem in normal use of the thin plate storage container, ~~but there is a~~ <sup>The</sup> ~~possibility for~~ the thin plate storage container to be <sup>will receive</sup> ~~be~~

<sup>in use</sup> ~~a~~ shocked when the thin plate storage container is mounted. In this case, the lid can ~~be~~ <sup>will</sup> ~~slipped~~ because of the gap between the container body and the lid and <sup>such an event</sup> ~~then~~ the sealing member <sup>will also</sup> ~~can be~~ slipped. In ~~this case,~~

although there is ~~not~~ <sup>the result</sup> problem about sealing, ~~it is not~~  
~~good for the aim of perfection.~~ <sup>desired</sup>

Moreover, in the thin plate storage container  
having ~~the~~ <sup>described</sup> above-mentioned structure, each of the  
5 supporting arm portions 38 of the wafer holder 36 is  
cantilevered such that base end of the arm is fixed at ~~the~~  
the upper cover 35 and the ~~top~~ <sup>distal</sup> end is free. ~~Thereby~~ <sup>thereby</sup> the  
supporting arm portions 38 ~~hold~~ <sup>with a</sup> the semiconductor  
silicon wafers 37 ~~by~~ <sup>strongly</sup> comparatively weak force, and it  
10 is difficult to hold the semiconductor silicon wafers  
37 ~~by strong force~~. Therefore, it is difficult to hold <sup>securely</sup>  
a kind of semiconductor silicon wafer 37 ~~having~~ <sup>of a</sup> large  
radius and heavy weight ~~securely~~ <sup>the</sup> and there is a problem  
that the semiconductor silicon wafers 37 are shaken ~~in~~ <sup>within</sup>  
15 the container.

~~Because~~ <sup>is</sup> regarding the wafer holder 36 cantilevered, each  
of holddown member 39 ~~of the wafer holder 36~~ <sup>is</sup> rotates  
~~around~~ <sup>about</sup> its base portion, ~~therefore~~ <sup>the</sup> if the semiconductor  
silicon wafers 37 slip, there is a problem that friction  
20 is ~~caused~~ <sup>generate</sup> between the holddown members 39 and the  
semiconductor silicon wafers 37 and ~~then~~ <sup>particulate matter</sup> dust is  
~~thereby~~ <sup>thereby</sup> generated.

#### SUMMARY OF THE INVENTION

25 The aim of the present invention is to provide a  
thin plate storage container ~~to prevent~~ <sup>wherein the</sup> a lid ~~from~~ <sup>is prevented</sup>  
slipping, ~~reduce~~ <sup>the</sup> load ~~on the~~ <sup>on the</sup> container body in conveyance  
~~to improve sealing condition, and to hold a plurality~~ <sup>is reduced</sup>

can be held  
of ~~the~~ thin plates securely within the container body. extending to 2.

embodiment of the  
The thin plate storage container of the first present invention comprises a container body, for storing ~~keeping~~

~~its inside clean, to store~~ a plurality of thin plates,  
5 and a lid ~~to~~ for close and seal the the container body. The thin plate storage container, in which the lid is taken off ~~remove~~ to pick up and insert the thin plates into the container body lying broadwise, The container body includes four side walls (flange) for receiving comprises a lid receptacle and surrounding the to set

the lid on an opening of the container body, lid supports located the  
10 ~~supporters which placed on at least bottom edge of the~~ lid receptacle when the container body lies broadwise, lid edge inserts, e.g. corner inserts, located to support the lid, and ~~contacting portions placed on~~ support inserts ~~a periphery of the lid and opposite to the lid supporters~~ cooperate supports ~~contact with the lid supporters to support the lid.~~

15 support inserts in Owing to ~~above mentioned structure,~~ the lid ~~supporters at the lid receptacle of the container body~~ The lid edge inserts ~~and the contacting portions on the periphery of the lid~~ directly ~~contact directly or through a slight gap when the lid~~ with therebetween is placed at the lid receptacle of the container body receives a

20 ~~In this state, if the container body is shocked by~~ Through careless handling of the thin plate storage container, will not the lid supporters and the contacting portions ~~contact directly to hold the lid, without slip of the lid from~~ the container body.

25 preferred It is preferred that each of the lid supporters support inserts mate be is formed as a convex dovetail to engage with a dovetail groove in placed at the lid receptacle, and that the a plane contacting surface ~~is placed on the surface of each of~~

lid support inserts be planar  
the lid supporters.

The lid receptacle is a flange including four corner portions, four planar edge surfaces connecting and integral surfaces of the lid supporter, protruding and with the four corner portions and a shoulder portion spaced from the container opening by the planar edge surfaces.  
5 ~~condition that the lid supporters engage with the~~

~~concave dovetail grooves.~~ SP Generation of dust and the like can be kept to the minimum because each contacting surface is designed as plane. planar The In this case, materials of lid supporters and contacting portions are selected to minimize that of the corner inserts

10 ~~from combination of materials that dust generation is kept to the minimum when they are fractionized each other.~~ rubbed by

includes It is preferable that each of the corner inserts ~~contacting portions~~ comprises a fixing plate portion to be inserted into and fixed in an engagement groove located at a corner ~~of periphery~~ of the lid, that and the contacting plate portion curved to conform to the corner of the lid in condition that the contacting plate portion is supported by the that the fixing plate portion and outside of the contacting plate portion form planar for contacting is a plane contacting surface inserts to contact the lid supporter.

Owing to above mentioned structure, The the contacting plate portion is positioned to cover a corner of the lid by insertion in condition that the fixing plate portion into is fixed on the engagement groove at the corner of the lid. Thus mounted planar In this condition, the contacting surfaces, plane ends contacting are in at and near the both end of the contact plate, contacts a support insert with the lid supporter to support the lid. Thereby, the

receives a shock  
lid scarcely slips when the container body is shocked,  
and thereby sealing quality is more improved.

The thin plate storage container of the second  
embodiment present invention comprises a container body, <sup>for storing</sup> to store  
holding and hold a plurality of thin plates in condition that  
5 and hold a plurality of thin plates in condition that  
inside of the container body is kept clean, and a lid  
for closing and sealing the interior to close and seal inside of the container body. The thin  
plate storage container, the lid is taken off from the  
container body and the thin plates are picked up from  
10 and inserted into the container body <sup>when is</sup> lying broadwise,  
it rests on <sup>sitting thereto</sup> comprises a supporting member placed to the container  
body, <sup>which</sup> and the supporting member further comprises a base  
plate <sup>positioned under and supporting</sup> portion placed at a lower end wall of the container  
body, <sup>when</sup> lying broadwise, to support the container body,  
25 the side plate <sup>and</sup> portions standing <sup>extending from opposing ends</sup> at both side of the  
base plate portion, and handles <sup>PP</sup> are provided on  
for lifting portions to be gripped to lift the container body.

No. 19 → —Owing to above-mentioned structure, the handles  
are gripped to lift the thin plate storage container,  
20 When these handles are gripped and lifted, it becomes  
that the supporting member is held directly, <sup>with</sup> and then  
the container body is supported by the base plate  
portion. Thereby <sup>any</sup> distortion caused by lifting of  
handles is absorbed by the side plates of the supporting  
25 member and the base plate portion, so that <sup>any</sup> the ill  
effects on the container body is minimized.

It is preferable that detents <sup>be provided in opposing</sup> are placed on both  
walls side plate portions of said container body.

NOTE

so that  
Owing to above mentioned structure, the container  
body can be supported more securely by the supporting  
members by engagement with lugs on the opposing  
~~engaging of the detents of~~ both sidewalls  
of the container body with the side plate ~~portions~~ of  
5 the supporting member.

It is preferable that conveyor rails be provided  
~~are placed~~  
on the side plate ~~portions~~ of the supporting member.  
so that Owing to above mentioned structure, the thin  
plate storage container <sup>1</sup> can be transferred by suspension from  
10 the conveyor rails <sup>of</sup> on a conveyor <sup>in a</sup> of production line <sup>or</sup> and  
the like ~~of factories~~ without any further <sup>or</sup> attachment <sup>or</sup> and  
modification.

It is preferable that be provided  
~~a positioning means~~ is placed  
on the base plate portion of the supporting member to  
for precise adjustment of  
15 ~~adjust~~ the mounting position of the container body  
~~precisely.~~

~~Owing to above mentioned structure, the mounting  
position of the container body can be precisely adjusted  
by the positioning means.~~

20 The thin plate storage container of the third  
embodiment for storing  
~~present invention~~ comprises a container body to store  
supporting clean  
and support a plurality of thin plates in condition that  
~~inside of the container body is kept clean, and a lid~~  
for closing and sealing <sup>a</sup> ~~the container~~  
25 ~~further comprises~~ thin plate supporting member placed  
the inside surface  
on inner side of the lid to support the thin plates at  
regular intervals. The thin plate supporting member  
comprises contacting portions for engaging ~~to engage~~ with the



periphery of each of the thin plates ~~to support,~~  
supporting portions ~~to support~~ the contacting portions  
~~elastically,~~ and a base supporting bar ~~portion placed~~  
inside of the lid to integrally support all of the  
5 plurality of the supporting portions aligned <sup>in</sup> parallel  
at regular intervals. Each base of the supporting  
portions is integrally connected with the base  
supporting bar ~~portion,~~ and the contacting portions are  
~~positioned in the middle~~  
~~placed on the midway~~ of the supporting portions, and  
10 the tip <sup>of</sup> the supporting portions contact <sup>the</sup> with inner  
~~side~~ <sup>surfaces</sup> of the lid to support the contacting portions from  
both sides ~~elastically.~~ <sup>elastically</sup> Thin

No 17 → ~~Owing to above mentioned structure, thin plates~~  
having large diameter and heavy mass <sup>thereby</sup> can be held  
15 securely because the supporting portions <sup>elastically</sup> support the  
contacting portions from both sides ~~elastically.~~

It is preferable that base side of each supporting  
portions <sup>be relatively</sup> ~~is~~ formed long, and tip side <sup>that the base</sup> ~~is~~ formed short. <sup>relatively shorter</sup>

No 18 → ~~Owing to above mentioned structure, the~~  
20 ~~supporting portions support the contacting portions in~~  
~~condition that the base supporting bar portion is placed~~  
~~on the inner side of the lid and the base of the base~~  
~~supporting bar portion is fixed on the lid. In this case,~~  
Since  
~~since~~ the distance between the base supporting bar  
25 portion and each of the contacting portions is <sup>relatively</sup> ~~formed~~  
long, the supporting portions push the <sup>contacting portions</sup> ~~lid supporters~~  
to the periphery of the thin plates <sup>2</sup> with weak force, ~~when~~  
~~each of the contacting portions contacts with each~~

See  
p. 27

~~periphery of the thin plates.~~ In addition, <sup>because</sup> ~~when~~ each  
tip side of the contacting portions ~~in the supporting~~  
~~portion~~ <sup>are in</sup> ~~contact~~ <sup>surface</sup> with the inner ~~side~~ of the lid, the  
contacting portions are elastically supported from both  
5 sides. ~~Then the~~ contacting portions are pushed toward  
the periphery of the thin plates with <sup>a</sup> strong force since  
the tip sides <sup>extending</sup> from the contacting portions <sup>relatively</sup> are ~~formed~~  
short. Although there is no difference <sup>in</sup> of elastic  
coefficient between ~~both~~ <sup>the two portions on opposite</sup> sides of each contacting  
10 portions, the supporting portions support the  
contacting portions with strong force since the tip  
sides <sup>relatively</sup> are short.

It is preferable that the supporting portions are  
<sup>to extend</sup> ~~as elevating~~ at both sides of the contacting  
15 portions, toward the thin plates within the container  
body. <sup>so as to</sup>

No. 2 ~~Owing to above mentioned structure, the rising~~  
~~and leaning parts exert a strong elastic force, since~~  
~~both sides of the supporting portions are elevated~~  
20 ~~toward the thin plates within the container body.~~

It is preferable that supporting stages <sup>be provided</sup> are placed  
<sup>the surface</sup> on inner ~~side~~ of the lid to support the tip <sup>ends</sup> side of the  
supporting portions. Thus

~~Owing to above mentioned structure, the~~  
25 supporting portions are supported from both sides by  
~~that the supporting stages being placed on the inner~~  
~~surface~~ side of the lid <sup>to</sup> support the tip <sup>ends</sup> of the supporting  
portions. Therefore the contacting portions are

supported by the supporting portions from both sides ~~of the contacting portions.~~ ✓

It is preferable that engagement portions <sup>which</sup> ~~to~~ engage with and support the tip <sup>ends</sup> ~~side~~ of the supporting portions <sup>formed</sup> ~~are placed~~ on the supporting base <sup>stages, so that</sup> ~~base.~~ 5

~~Owing to above mentioned structure,~~ the tip of each of the supporting portions is supported securely by engagement ~~of the tip of the supporting portions~~ with the engagement portions of the supporting stages. 10 Therefore the contacting portions <sup>stably</sup> ~~are supported~~ by the supporting portions, ~~stably.~~

It is preferable that a supporting ~~stage portions~~ <sup>stages</sup> ~~are placed on the tip of the supporting portions to~~ <sup>be fixed to</sup> ~~contact with~~ the inner side of the lid to support the contacting portions elastically from the tip side <sup>whereby</sup> ~~side.~~ 15

~~Owing to above mentioned structure,~~ the contacting portions are elastically supported by <sup>with</sup> ~~contact of the supporting stage portions~~ <sup>support stages fixed to</sup> ~~with the inner~~ side of the lid.

The thin plate supporting <sup>members are arranged</sup> ~~member is placed~~ as <sup>with</sup> ~~opposing each other~~ <sup>as both</sup> ~~and the contacting portions~~ <sup>are</sup> ~~aligned as opposing and sandwiching each other~~ to support the thin plates at regular intervals. 20

~~Owing to above mentioned structure, a plurality~~ 25 ~~of thin plates can be supported at regular intervals.~~

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a partial perspective view <sup>of</sup> ~~showing~~ a main

part of a container body of a wafer storage container according to <sup>3</sup>~~the~~ first embodiment. <sup>of the invention</sup>

Fig. 2 is a perspective view <sup>of</sup>~~showing~~ a container body of a wafer storage container according to <sup>3</sup>~~the~~ second embodiment.

Fig. 3 is a front view <sup>of</sup>~~showing~~ a lid supporter. <sup>insert.</sup>

Fig. 4 is a side view <sup>of</sup>~~showing~~ the lid supporter. <sup>insert of Fig. 3</sup>

Fig. 5 is a top view <sup>of</sup>~~showing~~ the lid supporter. <sup>insert of Fig. 3</sup>

Fig. 6 is a rear view <sup>of</sup>~~showing~~ the lid supporter. <sup>insert of Fig. 3</sup>

10 Fig. 7 is a perspective view <sup>of</sup>~~showing~~ a modified lid supporter. <sup>insert</sup>

Fig. 8 is a perspective view <sup>of a corner portion</sup>~~showing a main part~~ of the lid.

Fig. 9 is a perspective view <sup>of</sup>~~showing~~ the lid.

15 Fig. 10 is a perspective view <sup>of a lid corner insert</sup>~~showing a contacting~~ portion.

<sup>of</sup> Fig. 11 is a top view <sup>of</sup>~~showing~~ the <sup>lid corner insert</sup>~~contacting~~ portion. <sup>of Fig. 10</sup>

20 Fig. 12 is a perspective view showing a supporting member.

Fig. 13 is a perspective view <sup>of</sup>~~showing~~ the wafer storage container. <sup>of the invention</sup>

Fig. 14 is a top view <sup>of</sup>~~showing~~ the wafer storage container.

25 Fig. 15 is a perspective view <sup>of</sup>~~showing~~ a main part of the wafer storage container.

Fig. 16 is a perspective view showing a detent.

Fig. 17 is a perspective view <sup>(top)</sup>~~from above~~, showing

a thin plate supporting member of a thin plate storage container according to the second embodiment.

Fig. 18 is a perspective view <sup>of the</sup> ~~showing~~ a container body of the thin plate storage container according to the second embodiment.

Fig. 19 is a perspective view <sup>of the</sup> ~~showing~~ a lid of the thin plate storage container according to the second embodiment.

Fig. 20 is a perspective view <sup>of the reverse side (bottom) of</sup> ~~from below showing~~ <sup>Fig. 17.</sup> ~~a thin plate supporting member of the thin plate storage container according to the second embodiment.~~

Fig. 21 is a side view showing the thin plate supporting member <sup>shown in Figs. 17 and 20.</sup> ~~of the thin plate storage container according to the second embodiment.~~

Fig. 22 is a perspective view showing a strip projection <sup>on</sup> ~~of~~ the lid of the thin plate storage container according to the second embodiment.

Fig. 23 is a perspective view <sup>of</sup> ~~showing~~ the thin plate supporting member of the thin plate storage container <sup>(Figs. 17, 20 and 21) mounted on the strip</sup> ~~according to the second embodiment.~~ <sup>projections (Fig. 22)</sup>

Fig. 24 is a side view <sup>of a</sup> ~~showing~~ the first modification of the second embodiment.

Fig. 25 is a side view <sup>of a</sup> ~~showing~~ the second modification of the second embodiment.

Fig. 26 is a sectional view of a main part of a thin plate supporting member <sup>the</sup> ~~of~~ prior art.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the present invention will be described by way of two embodiments with reference to the attached drawings.

IN FIRST EMBODIMENT

~~First, the first embodiment is explained. In this embodiment, a storage container to store and transport semiconductor silicon wafers as thin plates is given as an example.~~

This wafer storage container 1 comprises, as shown in Fig. 2, 9, and 13, a container body 2 <sup>for supporting</sup> ~~to support~~ a plurality of semiconductor silicon wafers (not shown) ~~within the container body 2,~~ <sup>and</sup> wafer supporting plates (not shown) <sup>inside surfaces of</sup> ~~placed on the two sidewalls inside of this container body 2 facing each other to support a plurality of semiconductor silicon wafers, stored~~ <sup>in</sup> ~~inside~~ parallel and at regular intervals, from both sides of the wafer, <sup>A</sup> ~~a~~ lid 3 <sup>to seal</sup> ~~to seal~~ the upper opening of the container body 2 and <sup>the</sup> ~~to keep its~~ inside clean, <sup>A</sup> ~~and a~~ supporting member 4 ~~to support~~ the container body 2.

<sup>in the shape of a</sup> The container body 2 is formed ~~as~~ generally cube. For supporting detachable wafer supporting plates, a plurality of supporting protrusions 6 is placed on rear side and back side, inside of a sidewall portions 2A and 2B of the container body 2. A lid receptacle 7 is <sup>surrounds the</sup> ~~placed on an upper~~ opening of the container body 2 to engage with the lid. This lid receptacle 7 <sup>(flange)</sup> ~~is formed~~ by extending the upper <sup>edges of the side walls</sup> ~~opening~~ of the container body 2 to <sup>outer</sup> ~~meet the~~ diameter of the lid.

Engagement ~~bores~~ <sup>slots</sup> 8 are ~~placed on~~ <sup>formed in</sup> the lid receptacle 7 to engage with an ~~after mentioned~~ stop rollers 14 of the lid 3. These engagement ~~bores~~ <sup>slots</sup> 8 are ~~placed around~~ <sup>provided at</sup> each of four corners.

5 Lid ~~supporters~~ <sup>support inserts</sup> 10 are placed ~~on~~ <sup>at</sup> each ~~four~~ <sup>of the</sup> corners of the lid receptacle. Lid ~~supporters~~ <sup>support inserts</sup> 10 are, as shown in Fig. 1-6, formed like wedges having dovetail on both sides to engage dovetail grooves ~~placed on~~ the lid receptacle 7. At the center surface of each lid

10 ~~supporters~~ <sup>support insert</sup> 10, a protruding ~~line~~ <sup>ridge</sup> 11 ~~is placed over~~ <sup>extends the</sup> entire length of the lid supporter. A taper is ~~placed~~ <sup>formed</sup> on the outside of the protruding ~~line~~ <sup>ridge</sup> 11 (right side of Fig. 4) to prevent contacting with ~~contacting~~ <sup>corner inserts</sup> portions 16 when the lid 3 is ~~placed and detached~~ <sup>attached</sup>. Rear

15 side of the protruding ~~line~~ <sup>ridge</sup> 11 is a contacting ~~surface~~ <sup>protrusion</sup> 11A. This contacting ~~surface~~ <sup>protrusion</sup> 11A is ~~a part to contact~~ <sup>positioned</sup> with a ~~contacting portion~~ <sup>corner insert</sup> 16, and is formed as flat.

~~Since~~ <sup>Since</sup> it is ~~since~~ if there is a taper on the contacting surface 11A, uneven contacting pressure is ~~caused on all range~~ <sup>results over</sup> of contacting surface, and ~~then~~ dust is generated.

20 Besides ~~it~~, although the contacting ~~surface~~ <sup>protrusion</sup> 11A is narrow because of the configuration of the protruding ~~line~~ <sup>ridge</sup> 11, the area of the contacting ~~surface~~ <sup>protrusion</sup> 11A is set ~~to provide a~~ <sup>according to the</sup> balance between load and friction. It

25 is preferable that the contacting ~~surface~~ <sup>protrusion</sup> 11A ~~is~~ <sup>be</sup> designed as narrow as possible since there is a possibility of ~~confliction caused by contact between~~ <sup>corner insert</sup> the ~~contacting portion~~ <sup>insert</sup> and the lid supporter 10 when

the lid 3 is attached and detached. On the other hand,  
the protruding <sup>ridge</sup> ~~line~~ 11 must support the weight of the  
lid 3. For this reason, the area of the contacting  
~~of protrusion~~ surface 11A is ~~minimalized according to the balance with~~  
5 the weight of the lid 3. If the lid 3 is large and heavy  
~~one~~, to broaden its contacting area, the ~~installation~~  
~~of the protruding line 11~~ <sup>ridge</sup> can be omitted <sup>as in</sup> like Fig. 7.

A pair of lid support <sup>inserts</sup> ~~ers~~ 10 is placed at each four  
corners of the lid receptacle 7. In particular, the pair  
10 of lid support <sup>inserts</sup> ~~ers~~ 10 is ~~placed by~~ engaging <sup>ed</sup> with a pair  
of dovetail grooves on each of four corners of the lid  
receptacle 7, <sup>so that</sup> ~~and then~~ each pair of the lid support <sup>inserts</sup> ~~ers~~  
<sup>inserts</sup> 10 at each corner of the lid receptacle 7 supports each  
corner of the lid 3 squarely.

15 The lid 3 is, as shown in Fig. 8 and 9, formed as  
a thick quadrangular plate <sup>mates</sup> and ~~engaged~~ with the lid  
receptacle 7 of the container body 2. A flange portion  
3A is <sup>formed</sup> ~~placed on~~ <sup>the</sup> outer side of the lid 3 (lower part of  
Fig. 9) to cover the outside of the lid receptacle 7  
20 <sup>when</sup> ~~in condition that~~ the lid 3 <sup>is seated within</sup> ~~engages with~~ the lid  
receptacle 7. <sup>A</sup> ~~The stop roller 14 is placed around each~~  
corner of the lid 3, ~~in condition that the stop roller~~  
~~14 can rise and set freely.~~ On the surface of the lid  
3, a pair of key openings (shown in Fig. 13) <sup>provided</sup> ~~is placed~~  
25 <sup>retract</sup> ~~to rise and set~~ each stop roller 14 freely. The stop  
roller 14 <sup>is</sup> ~~connected by a link~~ <sup>whereby it is extended</sup> ~~is risen to~~  
<sup>within</sup> ~~engage with~~ an engagement <sup>slot</sup> ~~8~~ by insertion and  
rotation of the key. The key is placed on an arm of



<sup>2</sup> transport mechanism in <sup>2</sup> production line <sup>or</sup> and the like,  
and then the lid 3 is automatically <sup>attached</sup> set and detached.  
A sealing member (not shown) is placed on the inside  
periphery of the lid 3.  
5 <sup>corner inserts</sup> <sup>located at</sup> ~~contacting portions 16~~ are placed on the each  
corner of the lid 3. These <sup>corner inserts</sup> ~~contacting portions 16~~ are  
~~members to contact with the lid supporters 10 of the~~  
container body 2 to support the lid 3. Each of the  
<sup>corner inserts</sup> <sup>includes</sup> ~~contacting portions 16~~ is constructed by a fixing plate  
10 portion 17 and a contacting plate portion 18, as shown  
in Fig. 10 and 11. The fixing plate portion 17 has a  
shaft hole 17A, and the fixing plate portion 17 is  
<sup>and fixed within</sup> <sup>at</sup> ~~inserted into a contacting groove (not shown) on~~  
corner of the periphery of the lid 3 ~~to fix~~. The  
15 ~~contacting plate portion 18 is formed as curve to cover~~  
<sup>2</sup> ~~each corner of the lid 3, in condition that the contacting~~  
~~plate portion 18 is supported by the fixing plate~~  
~~portion 17.~~ Both sides of <sup>the</sup> outer surface of the  
contacting plate portion 18 are formed as a flat  
<sup>(planar)</sup> <sup>for</sup> ~~contacting surfaces 18A~~ to contact with the contacting  
20 <sup>protrusion</sup> <sup>inserts</sup> ~~surface 11A of the lid supporters 10.~~ Support legs  
<sup>formed at</sup> <sup>ends</sup> ~~portions 18B are placed on both sides of the contacting~~  
plate portion 18. These support leg <sup>bend</sup> ~~portions 18B~~ are  
~~formed by bending both sides of the contacting plate~~  
25 ~~portion 18 inward to support the contacting surface 18A~~  
~~by contacting with peripheral wall of the lid 3, in~~  
~~condition that the contacting plate portion 18 is placed~~  
~~on the corner of the lid 3.~~ <sup>Each</sup> The contacting surface 18A

~~supported by this support leg portion 18B contacts with~~  
a ~~the contacting surface 11A of the lid supporter 10 to~~ <sup>insert</sup> ~~support the lid 3, therefore if the lid body 2 is shocked,~~ <sup>receives a shock</sup>  
the lid 3 does not slip.  
5 ~~The materials of the lid supporter 10 and the~~ <sup>inserts</sup>  
~~contacting portion 16 must be chosen from the materials~~ <sup>corner insert</sup> ~~that generates little dust when frictionized with each~~ <sup>2</sup> ~~other. In particular, PBT (polybutylene terephthalate)~~ <sup>these elements contact</sup>  
resin, PEEK (polyether ether keton) resin, polyacetal  
10 ~~resin, supermacromolecular PE (polyethylene) resin, or~~ <sup>also</sup> ~~nylon resin is used for the material of the lid supporter~~ <sup>insert</sup>  
10. ~~Alternatively, the materials that PTFE~~  
(polytetrafluoroethylene) and/or carbon fiber ~~is added~~ <sup>also</sup>  
~~to these five materials are suitable, too. As well as~~  
15 ~~the lid supporter 10, 15 kinds of materials, such as~~  
PBT resin, PEEK resin, polyacetal resin,  
supermacromolecular PE resin, nylon resin, and ~~the~~ <sup>in addition</sup>  
~~materials that PTFE and/or carbon fiber is added to~~ <sup>corner insert</sup>  
~~these five materials, are suitable for the contacting~~ <sup>These may be suitably paired</sup>  
20 ~~portion 16. Suitable pair of these materials that~~  
~~so as to generate little dust when frictionized is used.~~ <sup>by</sup>

On the rear side of the lid 3, there is a thin plate  
supporting member 40. ~~Concrete structure of the thin~~ <sup>the which</sup>  
~~plate supporting member 40 is detailed in the second~~ <sup>is described in more detail</sup> <sup>connection with</sup>

25 ~~embodiment mentioned below.~~  
~~A supporting member 4 is a member to support the~~ <sup>Supporting</sup> <sup>which supports</sup>  
container body 2. ~~This supporting member 4 comprises,~~  
as shown in Fig. 12-16, a base plate portion 21,

sidewalls 22 and 23, and handles 24.

The base plate portion 21 is a plate <sup>which directly</sup> ~~material to~~ supports <sup>supports</sup> ~~the container body 2 directly.~~ The base plate portion 21 ~~is placed on the lower end of the container~~ <sup>when</sup> body 2 (lower part in Fig. 13) <sup>laid on its side to support</sup> ~~the container body 2.~~ The supporting member 4 and the container body 2 are fastened <sup>to</sup> each other by screws <sup>in</sup> ~~with~~ <sup>with</sup> ~~condition that~~ a plurality of supporting bars 26, placed <sup>and supporting</sup> on the surface of the base plate portion 21, ~~supports~~ the container body 2. In addition, <sup>provided</sup> positioning engagement portions 27 <sup>as positioning means</sup> ~~are placed~~ on the base plate portion 21 <sup>for adjusting</sup> ~~to adjust~~ the mounting position of the thin plate storage container. This storage container <sup>is provided with</sup> ~~consists of~~ three engagement <sup>elements</sup> ~~portions~~, 27A, 27B, and 27C. Each of the three engagement <sup>elements</sup> ~~portions~~, 27A, 27B, and 27C, consists of a V-shaped groove. The angle between <sup>the longer axes</sup> ~~long axis~~ of each engagement <sup>elements</sup> ~~portions~~, 27A, 27B, and 27C is generally <sup>elements</sup> ~~oriented in~~ 120°, and the three engagement <sup>elements</sup> ~~portions~~ are placed <sup>three</sup> ~~toward different three~~ directions. The dimensions ~~angle~~ and the like of the positioning engagement portions 27 have been standardized. There are three engagement protrusions (not shown) at positions corresponding to the position of each of the engagement <sup>and mating with</sup> ~~portions~~, 27A, 27B, and 27C, <sup>when</sup> ~~on the area that~~ the container body 2 is mounted. These engagement protrusions control the position of the container body 2 precisely by <sup>respectively</sup> ~~engaging~~ <sup>elements</sup> ~~each of the engagement portions~~ 27A, 27B, and 27C.

Side plates ~~portions~~ 22 and 23 <sup>extend perpendicular</sup> ~~are formed as~~ <sup>opposite ends</sup> standing from the both side of the base plate ~~portion~~ <sup>Handles</sup> 21. There are handles 24, ~~detent~~ <sup>are provided</sup> ~~receptacle portions~~ 28, and conveyor rails 29 <sup>for lifting</sup> on the side plates 22 and 23.

5 The handles 24 ~~are member to be held to lift the container~~ <sup>are member to be held to lift the container</sup> body 2. The handles 24 are formed as integral with the upper ends of the side plates 22 and 23. The ~~finger~~ <sup>detents</sup> ~~receptacle portions~~ 28 <sup>located</sup> are placed on the forward edges of the side plates 22 and 23 (near edge of Fig. 12).

10 The ~~finger~~ <sup>detents</sup> ~~receptacle portions~~ 28 are formed <sup>in</sup> by that the side plates 22 and 23 <sup>as</sup> ~~are~~ thinned and hollowed to <sup>recesses for receiving</sup> ~~engage after mentioned detents 30.~~ <sup>lugs 30 to be described below</sup>

The <sup>lugs</sup> ~~detents~~ 30 are <sup>designed</sup> ~~members~~ to <sup>securely</sup> ~~support~~ the supporting member 4 ~~on~~ the container body 2 ~~securely~~

15 by engaging with the ~~detents~~ ~~receptacle portions~~ 28 <sup>and thereby</sup> ~~securely to~~ prevent the side plates 22 and 23 from opening. The <sup>lugs</sup> ~~detents~~ 30 are <sup>located</sup> ~~placed~~ on the <sup>outer surfaces</sup> ~~forward~~ of the side plates 2A and 2B of the container body 2 (right <sup>side</sup> ~~hand~~ of Fig. 15). The <sup>cross-section</sup> ~~surface~~ of the <sup>lugs</sup> ~~detents~~ 30 <sup>is</sup> ~~are~~

20 L-shaped so that the <sup>lugs</sup> ~~detents~~ 30 <sup>on the</sup> ~~engage with~~ the ~~detents~~ ~~receptacle portions~~ 28 <sup>located</sup> ~~of each side plate 22 and 23.~~

The conveyor rails 29 <sup>are</sup> ~~placed~~ on the outside of each side plate 22 and 23. <sup>allow</sup> ~~Conveyor rails are the~~ <sup>containers</sup> ~~members to be hanged and to be carried by conveyors of~~

25 ~~a~~ <sup>or</sup> production line <sup>within a</sup> ~~and the like of each factory.~~ The conveyor rails 29 are ~~made of flat plates material and~~ <sup>are</sup> horizontally aligned <sup>dimension</sup> ~~outside~~ along the entire length of ~~longitudinal direction~~ of each side plate 22 and 23.

Reinforcement ribs are placed lengthwise and crosswise on the base plate ~~portion~~ 21 and side plate ~~portions~~ 22 and 23 to reinforce entire body.

~~The wafer storage container 1 structured as above~~  
5 ~~is used as below.~~

~~Firstly,~~ <sup>When</sup> semiconductor silicon wafers <sup>placed</sup> are ~~stored~~ <sup>put in place,</sup> in the container body 2 and then the lid 3 is placed. <sup>support inserts</sup> ~~Thereby the lid supporters 10 on the lid receptacle 7~~ of the container body 2 and the ~~contacting portions 16~~ of the lid 3 directly contact each other, <sup>have</sup> ~~or contact~~ through a slight gap. The wafer storage container 1 is then conveyed to its destination in this state.

~~During this conveyance, if the container body 2~~ <sup>receives a shock due to</sup> ~~is shocked by careless handling~~ <sup>or</sup> and the like, the lid <sup>support inserts</sup> ~~supporters 10~~ <sup>in</sup> contact with the <sup>corner inserts</sup> ~~contacting portions 16~~ directly to support the lid 3. <sup>To prevent</sup> ~~Then the slip of the lid~~ 3 from the container body 2 ~~is prevented.~~ <sup>minimized</sup>

Generation of dust and the like is <sup>support inserts</sup> ~~minimalized~~ <sup>corner inserts</sup> because the lid ~~supporters 10~~ and the ~~contacting~~ <sup>as</sup> ~~portions 16~~ are made <sup>by</sup> PBT resin, PEEK resin, polyacetal resin, supermacromolecular PE resin, or nylon resin, and each contacting surface, 11A and 18A, <sup>planar</sup> ~~is formed as flat.~~

~~The handles 24 are held and lifted to carry the~~ <sup>When holding</sup> ~~wafer storage container 1. Holding the handles 24 and~~ 25 ~~lifting the wafer storage container 1 becomes holding~~ <sup>is held</sup> the supporting member 4 directly, and ~~then the container~~ body 2 is supported by the base plate ~~portion 21.~~ <sup>At</sup> ~~In~~

this time, the side plate ~~portions~~ 22 and 23 are supported without <sup>opening</sup> ~~being opened~~ since the latch fingers 30 on the sidewall ~~portions~~ 2A and 2B of the container body 2 engage with the finger receptacle portions 28 on the side plate portions 22 and 23 of the supporting member 4; and when the handles 24 are held to lift the wafer storage container 1, the side plate portions 22 and 23 are stabilized without vacillation. <sup>There is no distortion or</sup> ~~Distortion~~ <sup>held by</sup> ~~and the like generated when the handles 24 is held is~~ <sup>because the distorting force</sup>

10 ~~is~~ absorbed by the side plates 22 and 23 of the supporting member 4, and the base plate ~~portion~~ 21, and ~~then~~ the effect on the container body 2 is <sup>thereby minimized</sup> ~~minimalized~~. Therefore, <sup>there is no adverse effect</sup> ~~the effect on the sealing member between the container body 2 and the lid 3 is prevented.~~

15 <sup>3</sup> In <sup>or</sup> ~~production lines~~ <sup>in a</sup> and the like of each factory, the conveyor rails 29 are <sup>held</sup> ~~hanged~~ by a conveyor to transport the container. In addition, the positioning engagement <sup>elements</sup> ~~portions~~ 27 <sup>are used to precisely</sup> ~~control the~~ position of the container body 2 ~~precisely~~ when the container is mounted on a mounting stand.

20 <sup>described</sup> As above, if the container body 2 <sup>receives a shock</sup> ~~is shocked~~, the lid supporters 10 and the <sup>corner inserts</sup> ~~contacting~~ portions 16 directly contact each other and the lid is supported without slip from the container body 2, ~~because the lid~~

25 ~~supporters 10 are placed on the container body 2 and the contacting portions 16 are placed on the lid 3.~~ Moreover, slip of the sealing member between the container body 2 and the lid 3 is prevented and ~~then~~

of the seal  
the ~~sealing~~ quality of the wafer storage container 1  
~~thereby~~  
is ~~more~~ improved.

Generation of dust and the like is ~~minimalized~~ minimized  
because the contacting surface 11A of each lid supporter ~~10~~ insert  
5 10 and the contacting surface 18A of the ~~contacting~~ corner insert  
~~portion 16~~ planar are ~~formed as flat~~ and the material of each  
contacting surface is carefully selected.

~~Deviation and the like generated when the wafer  
storage container 1 is lifted is absorbed by the side  
10 plate portions 22 and 23 of the supporting member 4 and  
the base plate portion 21 since the handles 24 are placed  
on the supporting member 4, and then the effect on the  
container body is minimalized and thereby the sealing  
quality is improved.~~

15 ~~Engagement between the detents 30 on the container  
body 2 and the detent receptacles 28 on the side plate  
portions 22 and 23 of the supporting member 4 prevents  
the side plates 22 and 23 from opening, and then the  
container body 2 is supported more securely.~~

20 ~~The conveyor rails 29 are placed on the side plate  
portions 22 and 23, therefore the container is conveyed  
by hanging the rail on the conveyor of production line  
and the like in each factory, without any attachment  
or modification.~~

25 ~~The mounting position of the container body 2 is  
precisely adjusted since the positioning engagement  
portion 27 is placed on the base plate portion 21.~~

Modifications:  
(1) Although the lid supporter inserts 10 and the

corner inserts provided at corners  
contacting portions 16 are placed on each of four edges  
of the lid receptacle 7 of the container body 2 in the  
above mentioned first embodiment, the lid supporters inserts  
10 and the contacting portions 16 can be also placed corner inserts, alternatively, provided  
only on the lower edge or lower edge and both edge of the  
laid container. In these cases, body 2 and lid 3 this case advantage in  
above-mentioned embodiment is described achieved taken when the laid  
container is handled. The lid supporters 10 and the corner inserts  
contacting portions 16 can be placed on all of the four  
edges of the lid receptacle or one edge only, according lid and on  
to the intended use using condition.

(2) The It is enough that the base plate portion 21  
and the side plates 22 and 23 of the supporting member  
4 are formed so that they can support the container body  
2 and can set the handles 24, so various shapes, not  
only planar flat shape, can be adopted for them.

### Second Embodiment

The second embodiment of the present invention is  
explained with reference to the attached drawings also illustrated by way of example, as  
20 In this embodiment, a storage container to store  
and carry thin-plate semiconductor silicon wafers as  
(thin plates) is taken for instance.

of the second embodiment  
This wafer storage container 41, as shown in Fig.  
18 and Fig. 19, comprises a container body 42 for storing to store  
25 a plurality of semiconductor silicon wafers (not shown)  
therein. Wafer are provided  
within it, wafer supporting plates 43 for supporting placed on opposite  
side walls in the container body 42 to support a  
the opposite plurality of semiconductor silicon wafers from both



sides of the wafers, which <sup>are</sup> stored within the container body, <sup>in</sup> parallel and at regular intervals, <sup>• lid</sup> and a lid 44 <sup>embodiment and is</sup> seals the ~~to seal an upper opening of the container body 44 and to keep the container's inside clean.~~

5 A lid receptacle 45 <sup>provided around</sup> is placed on upper part of the ~~opening of the~~ container body 42 to engage with the lid 44. This lid receptacle 45 <sup>(Slange) similar to Slange 7 of the first edges</sup> is formed by enlarging the upper end of the container body 42 <sup>surrounding the opening</sup> to meet the dimension of the lid. Various fixing means (not shown) are placed between the lid 44 and the lid receptacle 45 to fix the lid 44 onto the container body 42.

Reference No. 46 in Fig. 18 is <sup>A</sup> a carrier flange <sup>46</sup> ~~(Fig. 18) is engaged~~ part to be held by an arm of a carrier mechanism (not shown) <sup>on</sup> of a production line when the container is carried. Reference No. 47 is <sup>A</sup> a handle <sup>is provided to enable</sup> for a worker to carry the container ~~or to lift and lay along by hand.~~

Thin plate supporting member 51 is <sup>fixed</sup> placed on inner side of the lid 44 (upper side in Fig. 19). The thin plate supporting member 51 <sup>serves</sup> is members to support each ~~the upper edges of the~~ of stored semiconductor silicon wafers from their upside at regular intervals. The thin plate supporting member 51 <sup>will next be</sup> is explained according to Fig. 17 and Fig. 19-23.

The thin plate supporting member 51 <sup>includes</sup> mainly <sup>which</sup> comprise contacting portions 52 to engage with <sup>thereby</sup> the peripheries <sup>The</sup> of semiconductor silicon wafers and to <sup>• The contacting portions 52 are, in turn, destined to support</sup> support the semiconductor silicon wafers, supporting portions 53 to support the contacting portions

.A  
~~elastically, and a base supporting bar portion 54 placed~~  
the  
on inner side of the lid 44 (upper side of Fig. 19) to  
support a plurality of the supporting portions 53 in  
parallel, integrally and at regular intervals.  
5 ~~Engagement grooves 56 are placed on the side of~~  
formed in surfaces  
the contacting portions 52 forming ~~on the side opposite to the~~  
semiconductor silicon wafers. These engagement grooves  
serve to  
56 ~~are the members that engage with the periphery of~~ peripheries  
the semiconductor silicon wafers to support the wafers.  
10 The supporting portions 53 provided ~~are integrally placed~~ on both  
sides of the contacting portions 52.

~~The supporting portions 53 are members that are~~  
formed integral with the contacting portions 52 to  
support them. The supporting portions 53 are formed like in the shape of  
15 rods, are 21 ~~and made of~~ elastic synthetic resin, and support  
the contacting portions 52. The contacting portions 52  
positioned at middle  
~~are placed on the halfway of the supporting portions~~  
53. Therefore the contacting portions divide the  
~~52 forms~~ from the  
~~boundaries between base supporting portions 53A and tip~~  
20 ~~supporting portions 53B of the supporting portions 53.~~  
Each base end ~~part~~ of the tip supporting portions 53B is  
formed as 3 ~~integral with the~~ contacting portions 52. Caul  
plate portions 55 are formed at the ~~ends~~ of the tip  
supporting portions 53B. The caul plate portions 55  
25 ~~engage with below-mentioned~~ the engagement portions 62A of  
supporting stages 62 (as shown in Fig. 23) to support  
the tip supporting portions 53B. The ~~Thereby the~~ contacting  
portions 52 thereby ~~are~~ elastically supported by the base

supporting portions 53A and the tip supporting portions 53B from ~~both~~<sup>opposite</sup> sides.

The base supporting portions 53A are formed ~~long~~<sup>relatively shorter</sup> and the tip supporting portions 53B are ~~formed short~~<sup>longer</sup>.

5 Since the base supporting portions 53A are ~~formed long~~<sup>relatively shorter</sup>, the base supporting portions 53A press the contacting portions 52 ~~on~~<sup>onto</sup> the periphery of the semiconductor silicon wafers with ~~weak~~<sup>2</sup> force at first when the contacting portions 52 contact ~~with the periphery~~<sup>the peripheries</sup> of the semiconductor silicon wafers. Then, since the tip supporting portions 53B are ~~formed short~~<sup>shorter</sup>, the caul plate portions 55 at the end of the tip supporting portions 53B contact ~~with~~ the inner surface of the lid 44, and support the contacting portions 52 with ~~strong~~<sup>A</sup> force, ~~whereby~~<sup>onto</sup> the contacting portions 52 are pressed ~~on~~<sup>2</sup> the periphery of the semiconductor silicon wafers with ~~strong~~<sup>2</sup> force.

Depending on ~~the~~<sup>there may be</sup> situations, gaps ~~having of a~~ predetermined width ~~are given~~ between the tip supporting portions 53B and the engagement portions 62A ~~of the supporting stages 62~~<sup>(Fig. 23)</sup>. If the gaps ~~are given~~<sup>a gap is present</sup>, the contacting portions 52 are supported by only the base supporting portions 53A from one side ~~to~~<sup>and therefore</sup> support the semiconductor silicon wafers with ~~weak~~<sup>2</sup> force, ~~in~~ condition that the contacting portions 52 contact with the periphery of the semiconductor silicon wafers. In addition, if the semiconductor silicon wafers are shaken hardly ~~by~~<sup>an</sup> external force such that the wafer

storage container 41 is swung <sup>or</sup> ~~and~~ the like, the contacting portions 52 are pushed and thereby the tip supporting portions 53 <sup>come into</sup> ~~B~~ contact with the engagement portions 62A of the supporting stages 62 to <sup>elastically</sup> ~~support~~ the semiconductor silicon wafers ~~elastically from both sides of the wafers with~~ <sup>a</sup> strong force. On the other hand, if ~~the~~ gaps are not <sup>present</sup> ~~given~~, the semiconductor silicon wafers are supported with strong force from the start.

In the supporting portions 53, both sides of the contacting portions 52 are formed <sup>to protrude in</sup> ~~by protruding~~ the ~~contacting portions 52 to the~~ direction of ~~the~~ semiconductor silicon wafers stored in the container body 42. <sup>Slanted portions</sup> ~~Slant parts~~ of the supporting portions 53 <sup>serve to enhance</sup> ~~slanted by protruding~~ enforce the elastic force of the supporting portions 53.

Base supporting ~~bars~~ <sup>integral with and</sup> portions 54 are ~~members to~~ support each supporting portion <sup>in</sup> 53 ~~parallel and at regular intervals. These base supporting bars~~ portions 54 ~~support each supporting portion 53 and engaged with~~ <sup>are also</sup> ~~below mentioned supporting grooves 64~~ <sup>(Fig. 22)</sup> to be fixed on inner side of the lid 44.

<sup>Projecting strips</sup> ~~There are strip projections 61 on~~ inner side of the lid 44. ~~These strip projections 61 are members to support the tip of the supporting portions 53. The strips~~ <sup>Tips</sup> ~~are formed with~~ <sup>are formed with</sup> projections 61 ~~are structured by supporting stages 62 and supporting recesses 63 aligned alternately. Two supporting recesses 63 are~~ <sup>arranged in</sup> ~~placed~~ parallel on the inner side of the lid 44. This structure <sup>is for supporting</sup> ~~is for supporting~~

~~each caul plate portion 55 of oppositely placed two thin~~  
~~plate supporting members 51. The supporting stages 62~~  
~~of one strip are aligned with the other~~  
~~and the supporting recesses 63 of each strip projection~~  
~~61 are placed as shifting from each other. Namely, the~~  
5 ~~supporting stages 62 and the supporting recesses 63 are~~  
~~arranged~~  
~~placed as opposing each other.~~

The supporting stages 62 of the ~~strip projections~~  
~~61 are members to support the caul plate portions 55~~  
~~on the tip of the supporting portions 53. The engagement~~  
10 ~~portions 62A are placed on the supporting stages 62.~~  
~~These engagement portions 62A are parts to engage with~~  
~~the caul plate portions 55 on the tip of the supporting~~  
~~portions 53 and to support the caul plate portions 55.~~  
~~The engagement portions 62A are formed as recesses to~~  
15 ~~engage the caul plate portions 55 and prevent rightward~~  
~~and leftward slip.~~

The supporting ~~recess portions 63 are members to~~  
~~engage and support the base supporting portions 53A.~~  
~~The supporting recess portions 63 are formed lower than~~  
20 ~~the supporting stages 62. The height of the supporting~~  
~~recess portions 63 is set optimally according to each~~  
~~the intended use~~  
~~situation. If a user wants to support the~~  
~~semiconductor silicon wafers with strong force, use the~~  
~~supporting stages 62 and the supporting recess portions~~  
25 ~~63 to support the wafers. Therefore the height of the~~  
~~supporting recess portions 63 should be set as that the~~  
~~base supporting portions 53A can contact with the~~  
~~supporting recess portions 63. On the other hand, if~~

a user does not want to support the wafers with strong force, ~~use the base supporting bar portions 54 and the supporting stages 62 to support the wafers.~~ Therefore the height of the supporting ~~recess~~ <sup>recesses</sup> portions 63 should be set <sup>so</sup> ~~as~~ that the base supporting portions 53A <sup>are</sup> ~~do not~~ <sup>are</sup> ~~in~~ contact with the supporting ~~recess~~ <sup>recesses</sup> portions 63.

~~The~~ <sup>provided with</sup> ~~In outside of the two strip projections 61, there are the supporting grooves 64 to engage with and support the base supporting bar portions 54 of the thin plate supporting member 51. The supporting grooves 64 are~~ <sup>of the grooved supports</sup> ~~formed as grooves having diameter to engage with the base supporting bar portions 54. Two base supporting bar portions 54 of the thin plate supporting member 51~~ <sup>are fitted within the</sup> ~~opposing each other engage with these two supporting grooves 64, and thereby the contacting portions 52 of~~ <sup>of grooved supports</sup> ~~two thin plate supporting members 51 are~~ <sup>thereby</sup> ~~aligned as~~ <sup>the</sup> ~~opposing and sandwiching each other to support each semiconductor silicon wafers at regular intervals. The two thin plate supporting members 51 have the same structure, and are placed oppositely.~~ <sup>arranged opposed to each other</sup>

~~The thin plate storage container structured as above is used as follows.~~

<sup>In use</sup> ~~At first, a plurality of semiconductor silicon wafers is stored inside the container body 42. Each of semiconductor silicon wafers is supported by the wafer supporting plates 43 at regular intervals.~~ <sup>wherein they are</sup>

<sup>No. 9</sup> ~~The~~ <sup>then fitted on</sup> ~~In this condition, the lid 44 is placed at the lid receptacle 45 of the container body 42. Thereby the~~ <sup>whereby</sup>

contacting portions 52 of the thin plate supporting members 51 engage with and support each semiconductor silicon wafer.

~~In condition that the contacting portions 52~~  
5 ~~contact with the wafers, if~~ <sup>when</sup> <sup>fully seated</sup> the lid 44 is placed deeply into the lid receptacle 45, the contacting portions 52 are pushed up <sup>by the silicon wafers</sup> toward the inner side of the lid 44. Thereby the base supporting portions 53A, ~~supported by the base supporting bar portion 54 which fixed on the supporting~~  
10 <sup>support</sup> groove 64, ~~contacts with the contacting portions 52 with a~~ <sup>which is received by the</sup> weak force, ~~and then support each semiconductor silicon wafer.~~ <sup>However,</sup> ~~Otherwise, if~~ the caul plate portions 55 of the supporting portion 53 engage with the engagement portions 62A of the supporting stages 62, ~~and support~~  
15 ~~the contacting portions 52 from both sides, and then~~ <sup>are supported</sup> <sup>the</sup> each semiconductor silicon wafers <sup>are then</sup> supported with <sup>by a stronger</sup> ~~stronger~~ force. <sup>Further</sup> <sup>if</sup> ~~More otherwise,~~ the base supporting portions 53A <sup>come into</sup> contact with the supporting recesses 63, <sup>then</sup> ~~and the supporting stages 62 and the supporting recesses~~  
20 63, opposite each other, <sup>also</sup> support the contacting portions 52. ~~Namely, the supporting stages 62 and the supporting recesses 63, opposite each other,~~ <sup>i.e.</sup> support the supporting portions 53 directly and the contacting portions 52 indirectly. <sup>whereby</sup> ~~Thereby~~ each semiconductor silicon wafer is supported <sup>by a yet stronger</sup> ~~with more strong force.~~  
25 <sup>The</sup> ~~Owing to the above mentioned structure,~~ <sup>described</sup> <sup>serves to support</sup> both small light semiconductor silicon wafers and large heavy semiconductor silicon wafers ~~can be supported~~

securely with optimum force.

Moreover, almost no dust is generated <sup>at points of</sup> ~~on each~~ contacting point, so generation of dust and the like can be minimized.

5 Since the thin plate supporting member 51 is formed ~~so~~ <sup>the</sup> ~~as~~ that ~~each~~ contacting portions 52 are aligned oppositely and alternately, the distance between ~~each~~ <sup>between the</sup> ~~the~~ contacting portions 52 and supporting portions 53 of the thin plate supporting member 51 can be ~~taken widely~~ <sup>relatively wide</sup> and ~~then~~ the thin plate supporting members 51 can be ~~metal-molded~~ <sup>more</sup> easily. The structure of the metal mold can be simplified <sup>whereby</sup> and ~~then~~ the metal mold can be made ~~inexpensively~~ <sup>2nd</sup> ~~thereby~~ the production cost of the thin plate supporting member 51 can be ~~kept low~~ <sup>reduced</sup>.

15 Modifications of the Second Embodiment  
(1) Although two thin plate supporting members 51 ~~are~~ <sup>used</sup> ~~placed~~ <sup>as described above</sup> oppositely each other in the second embodiment, one, two or more than three thin plate supporting members 51 can ~~be~~ <sup>be used</sup> also set according to the number of the semiconductor silicon wafers to store ~~and the~~ <sup>in the described</sup> ~~the~~ same function and effect ~~as above mentioned~~ <sup>embodiments</sup> can be obtained ~~in these case~~.

20 (2) Although the supporting stages 62 are placed on the inner side of the lid 44 to support the tip ends of the supporting portions 53 in the second embodiment, it is ~~also available that~~ <sup>possible to locate the</sup> supporting stage portions 71 ~~are directly set on the caul plate portions 55 placed at the tip sides of the supporting portions 53 as shown in Fig. 24. And as shown in Fig. 25, it is available~~ <sup>Further,</sup> <sup>also possible</sup>



to elongate and extend (distal)

that the tip supporting portions 53B are ~~elongated up~~  
to the inner side of the lid 44 ~~to be~~ become lid supporters  
while realizing the ~~The same function and effect as above-mentioned~~  
in the described  
embodiments ~~can be obtained in these case.~~

5 mentioned (3) Although semiconductor silicon wafers are  
~~taken as an example of thin plates in above mentioned~~  
the foregoing description of the

first and second embodiments, other thin plates ~~that can be~~

~~affected by various kind of gas or fine grain, such as~~

glass plates, memory discs and the like, can be also

housed within  
10 ~~adopted for the thin plate storage container of present~~  
invention.

## ABSTRACT

A wafer storage container has a container body and  
a lid. ~~Thin plates are inserted into and picked up from~~  
5 ~~the container body.~~ The container <sup>body</sup> has lid support <sup>inserts</sup>  
~~in~~ placed on a lid receptacle of the container body, and  
~~the lid has corner inserts for~~ <sup>support inserts</sup>  
~~contacting portions~~ contact with the lid ~~supporters~~ to  
support the lid. A supporting member is a ~~member~~  
attached to ~~support~~ the container body. The supporting  
10 member <sup>includes</sup> has a base plate portion ~~to support the container~~  
~~body, side plate portions~~ <sup>plates extending</sup> ~~formed as standing~~ from the  
base plate portion, and a handle on each side plate  
~~for lifting~~ <sup>gripped</sup> to lift the container body. The thin plate  
supporting member has contacting portions to support  
15 thin plates, supporting members <sup>which elastically</sup> ~~to~~ support the  
contacting portions elastically, and <sup>a</sup> base supporting  
bar ~~portions~~ to support the supporting portions. <sup>The tip</sup>  
end of each supporting portion contacts ~~with a~~  
~~support~~ <sup>contacting</sup> portion of each supporting stage, and  
20 elastically supports the contacting portions from both  
sides.

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**